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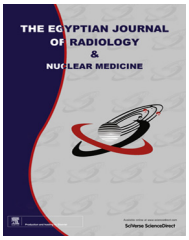

ORIGINAL ARTICLE

Magnetic Resonance Imaging Evaluation of Perianal Fistulas

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KEYWORDS

Perianal fistulae;
Magnetic resonance imaging;
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Suprasphincteric

Abstract *Purpose:* The purpose of this study was to discuss the usefulness of magnetic resonance imaging in evaluating perianal fistulas, their ramifications, extent, associated abscesses and relations with the anal sphincter complex and its role in preoperative classification.
Material & methods: A retrospective study was carried out using picture archiving and communication system. Data of 58 patients presented with a clinical suspicious of perianal fistula from April 2012 to March 2013 was collected. In all patients pre contrast T2 propeller with and without fat suppression, diffusion weighted and pre and post contrast liver acceleration volume acquisition sequences were obtained. Pulse sequences were as follows: T2 propeller (TR: 7766 ms, TE: 122 ms), Diffusion weighted (TR: 7000 ms, TE: 67 ms), LAVA (TR: 7 ms, TE: 3.242 ms).
Results: MRI revealed a total number of 38 fistulae in 35 (60%) patients while 13 (22%) patients had only perianal sinuses. Out of these 35 patients, 4 were females and 31 were male subjects. Out of total 38 fistulae seen in these 35 patients, 11 (29%) were transsphincteric, 24 (63%) were intersphincteric and 2 (5%) were suprasphincteric. Only 1 (3%) case was extrasphincteric fistula. Twenty-six fistulae (68%) were simple, whereas 12 (32%) showed associated abscess formation, inflammation and branching course.

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Conclusion: Our results support that MRI is the method of choice for evaluating perianal fistulae as they display the anatomy of the sphincter muscles orthogonally with a background of good contrast resolution. Moreover, with MRI we can accurately classify perianal fistulas preoperatively along with the detection of associated infection and help in planning a successful surgery.

1. Introduction

Perianal fistula is a wearisome disease for both the patient as well doctors; it is as old as the mankind (1). Perianal fistula is a connection between the anal canal and the skin of the perineum (2), and it is characterized by the presence of a tract lined by granulation tissue which connects deeply into the anal canal or rectum and superficially on the skin around the anus. It usually results from an ano-rectal abscess which bursts spontaneously or exposed inadequately (1,2).

Perianal fistulization is an uncommon process, with a prevalence of 0.01%, although it causes significant morbidity. It predominantly affects young males, with a male-to-female ratio of 2:1. The most common presenting symptom is discharge, discomfort and fever but local pain due to inflammation is also common (2,3) However, fistulas may be completely asymptomatic (4).

Perianal fistula is a commonly encountered disease infamous for its recurrence because of associated concealed infection (5).

The initiating event according to the 'cryptoglandular hypothesis' in the formation of perianal fistulas is infection of the intersphincteric glands, which may then track down either the intersphincteric plane to the skin or may traverse both anal sphincter layers to enter the ischioanal fossa. Alternatively, pelvic infections may also track down the ischioanal fossa to reach the skin, referred to as extrasphincteric fistulas (5,6).

The treatment of fistulas requires surgery. While this is successful in most cases, it is associated with a significant prevalence of recurrence (7). Successful surgical management of anal fistulas requires accurate preoperative assessment of the course of the primary fistulous track and the site of any secondary extension or abscesses (8).

Researches have shown that techniques used for imaging perianal fistulas including fistulography, anal endosonography and CT have proved no better than clinical examination and are uncomfortable to the patient on one hand and or lack the ability to demonstrate secondary tracts and relationship of the fistulous tracts with the sphincter complex (5,6).

Although imaging techniques played a limited role in the evaluation of perianal fistulas in the past, it has been increasingly recognized that imaging techniques, especially magnetic resonance imaging play a crucial role. MRI being a multiplanar imaging technique along with benefits of excellent soft tissue differentiation makes it an ideal diagnostic study to identify infected tracks and undetected abscesses. A detailed assessment of the anatomic relationship between the fistula and the anal sphincter complex allows surgeons to choose the best surgical treatment thus significantly reducing recurrence of the disease or possible secondary effects of surgery, such as fecal incontinence (9,10).

CT scan reveals thickness of muscles like pubo rectalis sling and external anal sphincter whereas MRI reveals structure of muscles in multiple planes i.e. Axial, Coronal and sagittal (1). MRI allows accurate assessment of associated abscesses, horse shoe and secondary tracts (11,12) alerting the surgeon about the complex nature of the disease (5,6,12) and providing an excellent road map prior to surgery (13).

MR imaging is the optimal technique for distinguishing complex from simple perianal fistulas, although anal endosonography is superior to clinical examination and may be used if the availability of MR imaging is limited (14).

In our article, we discuss the usefulness of MRI in evaluating perianal fistulas, their ramifications, extent, associated abscesses and relations with the anal sphincter complex and its role in preoperative classification.

2. Material and methods

A total number of 58 patients whose MRI studies were done from April 2012 to March 2013 were retrieved using picture archiving and communication system and were evaluated retrospectively.

All patients underwent MRI pelvis using MRI scanner (Optima™ MR 450 W 1.5 Tesla). No patient preparation was carried out. Patient was placed in supine position for acquisition of images. Axial and sagittal images were used as localizers for subsequent images. Imaging volume included data acquisition from distal rectum up to the subcutaneous tissues. MRI machine was used for all the patients using standard recommended positions for MRI pelvis. Injection Dotarem 0.5 mmol (Guerbet) was used as intravenous contrast medium for all the patients in a dose of 0.2 ml/kg body weight. In all the patients sequences obtained were as follows; pre contrast oblique axial, oblique coronal and sagittal T2 propeller with and without fat suppression, axial diffusion weighted and pre and post contrast SPGR-LAVA [Liver acceleration volume acquisition] images. Pulse sequences applied were as follows: T2 propeller (TR: 7766 ms, TE: 122 ms), Diffusion weighted (TR: 7000 ms, TE: 67 ms), LAVA (TR: 7 ms, TE: 3.242 ms). LAVA images have a slice thickness of 2 mm with a slice distance of 1 mm while T2 propeller and diffusion weighted images have slice thickness of 4.5 mm and slice distance of 5.5 mm. All images were evaluated on workstation (VEPRO, Germany).

Data was evaluated by using statistical package for social sciences (SPSS) software version 10 for calculating percentages and frequencies.

3. The anal clock

Anal fistulas are classified according to their progression relative to the anal sphincter and pelvic floor structures. To

characterize a perianal fistula, it is essential to adequately describe the point of origin in the anal canal and the path of the fistula with respect to the pelvic anatomic boundaries (15). With the patient in the lithotomy position, the anterior perineum is located at 12 o'clock and the natal cleft is at 6 o'clock, with the left lateral aspect of the anal canal at 3 o'clock and the right lateral aspect at 9 o'clock (16). These descriptions correspond exactly with the view of the anal canal on axial MR images obtained with the patient in the decubitus supine position. To locate the point of origin and describe the direction of the fistulous track, we use an ''anal clock'' scheme which is the same as that used by surgeons to describe injuries around the anal region (15).

4. Classification of perianal fistulas

In our study we use Parks classification of the perianal fistula, in which the external sphincter is used as the keystone and depending on the location and course of the primary tract, perianal fistulae have been classified into four types;

1- Intersphincteric: the infection starts from an anal gland and develops in the intersphincteric plane, lying between the internal and external sphincters, without penetrating the external sphincter. It eventually ruptures onto the skin, thereby creating the fistula.
2- Transsphincteric: this occurs when the intersphincteric infection penetrates the external sphincter to reach the ischioanal fossa and, eventually, the perianal skin.
3- Suprasphincteric: these fistulae extend superiorly in the intersphincteric plane to reach above the levator plane and then penetrate inferiorly through the ischioanal fossa.
4- Extrasphincteric: these result from extension of primary pelvic disease (e.g., Crohn's disease, diverticulitis, radiation proctitis) down through the levator plate (17).

5. Results

Out of 58 patients in our study, 10 patients (18%) had normal study with no MRI evidences of perianal sinus or fistula formation, 13 patients (22%) were identified as having a perianal sinus only, with no fistula extending into the anal canal. Rest of 35 cases (60%) revealed perianal fistulas which were evaluated for the site of the primary tract and its ramifications, the presence and absence of external sphincter involvement, and the location of the internal openings.

Out of 35 cases with perianal fistula 4 (11%) were females and 31 (89%) were male subjects. Youngest patient included in our study was 17 years of age and oldest 70 years of age.

Two out of 4 female patients had a perianal fistula associated with Crohn's disease and one of them showed horseshoe abscess formation. Rest of the two female patients showed low lying trans-sphincteric fistula with large right ischeorectal fossa abscess associated with inflammatory changes and high transsphincteric fistula with no abscess formation or inflammatory changes, respectively.

A total of 30 male patients were diagnosed with perianal fistulas. Out of those 30 patients, two had multiple fistulae and abscess formation. Of the remaining, 26 patients had a single fistula with four of them previously treated for perianal abscess drainage. Three patients had undergone one or more previous fistula surgeries and presented with recurrence.

Out of a total of 38 fistulae in 35 patients, 11 (29%) were transsphincteric, 24 (63%) were intersphincteric and 2 (5%) were suprasphincteric. One case with extrasphincteric fistula (3%) was encountered in the study. Twenty-six fistulae (68%) were simple, whereas 12 fistulae (32%) showed complications including abscess formation, branching course, and inflammatory tissue. Recurrent post operative perianal fistulae were seen in 6 patients (15%).

Patient's data was evaluated regarding presenting complaints which showed, 13 cases presented with pain, 4 cases with painless perianal swelling, while 4 cases had a history of discharge. Fourteen patients had more than one of the abovementioned complaints.

6. Discussion

We retrospectively studied a total of 58 patients presented to Radiology department with clinical suspicion of perianal fistula. MR imaging was carried out using MRI scanner Optima™ MR 450 W 1.5 Tesla with phased-array coil. Multiplanar and multisequental imaging helped us in interpretation of perianal fistula and associated complications especially obscured abscess formation. A combination of sequences was used as a protocol of MRI pelvis in diagnosing perianal fistula. Besides standard T1 and T2 weighted images, fat suppressed, diffusion weighted and liver acceleration volume acquisition images were part of the protocol. Every sequence has its own significance with few indentifying complex anatomy of sphincter complex and muscles while others highlighting the fistulous tract and associated complications. Multiplanar imaging including axial, coronal and sagittal images helped in the identification of fistula and better tracing of its course and branches.

Pre contrast axial T1-weighted images precisely identified sphincter complex, levator plate and ischiorectal fossa and helped us to have a better anatomical orientation. Fistula itself and associated abscess formation exhibits hypointense signals and therefore was not readily appreciated on this sequence. However three cases in our study presented with a history of recent surgical intervention depicting associated hemorrhage appeared as hyperintense signal, thus identifying the actual contents of the fistulous tract, when correlated with T2 weighted images.

T2- weighted images without fat suppression allowed exceptional visualization of different layers of sphincter complex with internal sphincter appearing as hyperintense structure.

With background anatomical information gathered in T2-weighted images, T2 propeller images with fat suppression clearly indentified hyperintense fistulous track, its course and branches (Fig. 6). Abscess cavities were easily identified as hyperintense collections on T2 propeller sequences (Figs. 1 and 4). Adequate background suppression of normal hyperintense anatomical relations including muscles, sphincter and fat was considered the most important factor for the identification of fistula (Fig. 3).

Liver acceleration volume acquisition is spoiled gradient echo pulse which provides high resolution images that

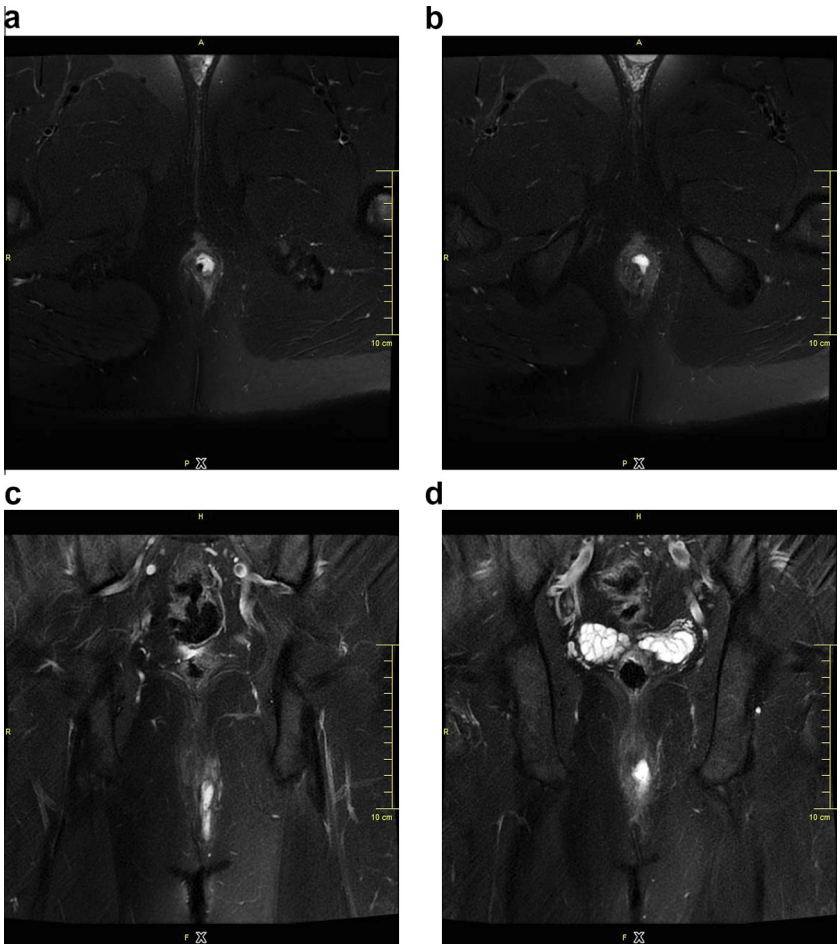

Fig. 1 (a–d): Axial (a–b) and coronal (c–d) T2 propeller with fat suppression exhibit intermediate lying inter-sphincteric fistula with associated inter sphincteric abscess.

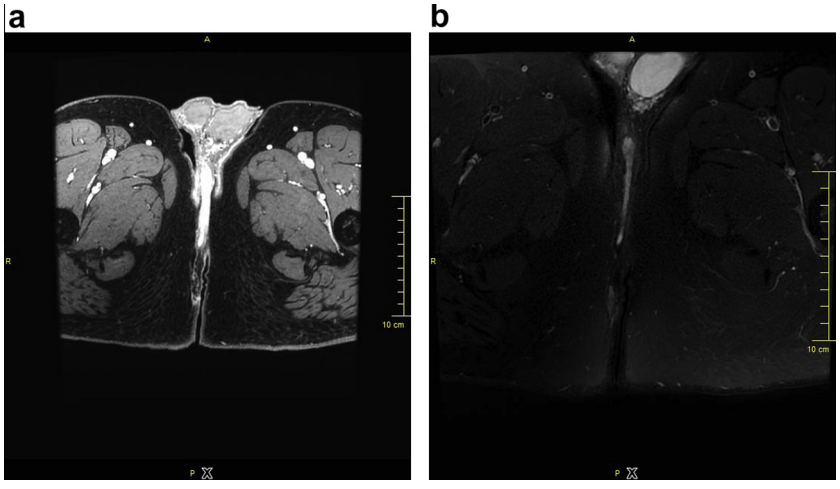

Fig. 2 (a–b): Axial T2-weighted (a) and post contrast LAVA (b) images displaying sinus tract coursing anteriorly along the medial aspect of thigh reaching perineum and scrotal junction.

optimize inversion pulse and fat suppression technique. SPGR post contrast LAVA images were acquired in both in-phase and out-phase thus helping to differentiate between fluids containing fistula from surrounding fat (Fig. 4). Images were acquired in both axial and coronal planes and well demonstrated avidly enhancing fistulous tracts, its branching and

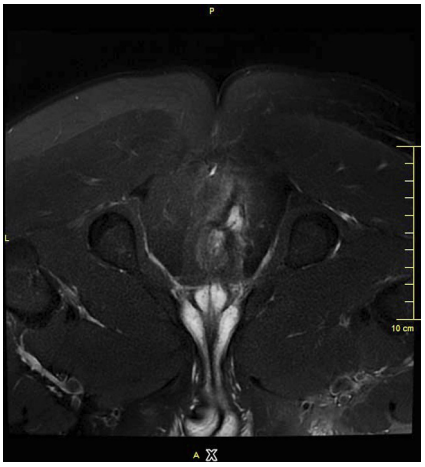

Fig. 3 Axial T2-weighted image with fat suppression showing high lying trans-sphincteric fistula near anorectal junction at 7 o'clock position.

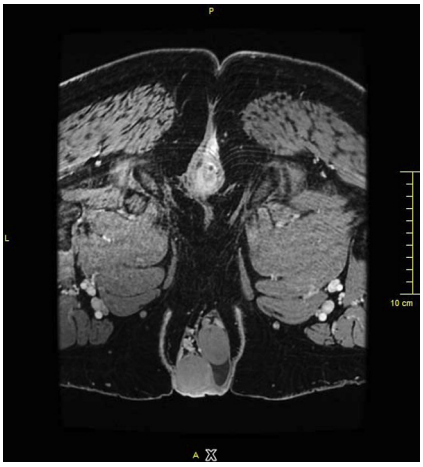

Fig. 5 Axial LAVA post gadolinium image displaying low lying inter hemispheric fissure within the anal canal at 7 o'clock position.

course (Figs. 2 and 5). Edema and inflammatory changes associated with perianal fistula are readily depicted on these sequences, thus preparing the surgeon beforehand to deal with the disease process thoroughly (Fig. 7).

Diffusion weighted images are a part of combination of sequences used in our department for the evaluation of peri-anal fistula. Diffusion weighted images display information based on diffusion of water molecules. As inflammatory tissues have a high signal intensity on diffusion weighted images, it is considered as a potential sequence for diagnosing perianal fistula, particularly complimenting T2 weighted images. This promising sequence can be helpful especially in cases where contrast administration is contraindicated.

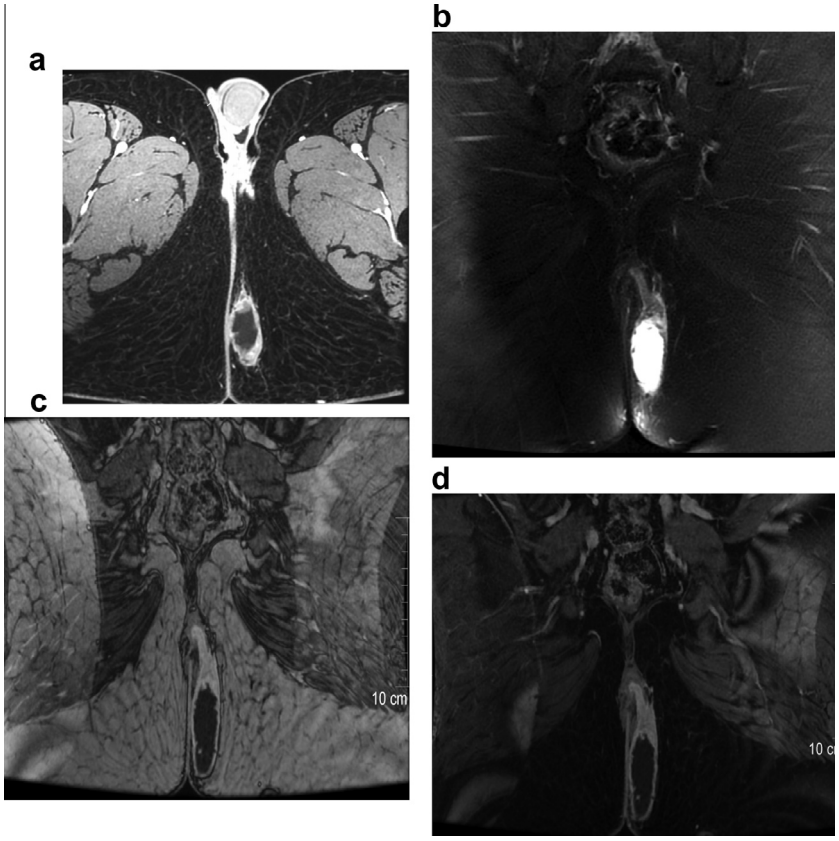

Fig. 4 (a–d): Perianal collection in left buttock displaying avid peripheral contrast enhancement on (a) axial lava image and appearing significantly hyperintense on (b) coronal T2 propeller image. A trans-sphincteric sinus branch evident opening within anal canal about 2.7 cm from anal verge at 5–6 o'clock position seen on (c and d) coronal out phase and in phase lava sequences.

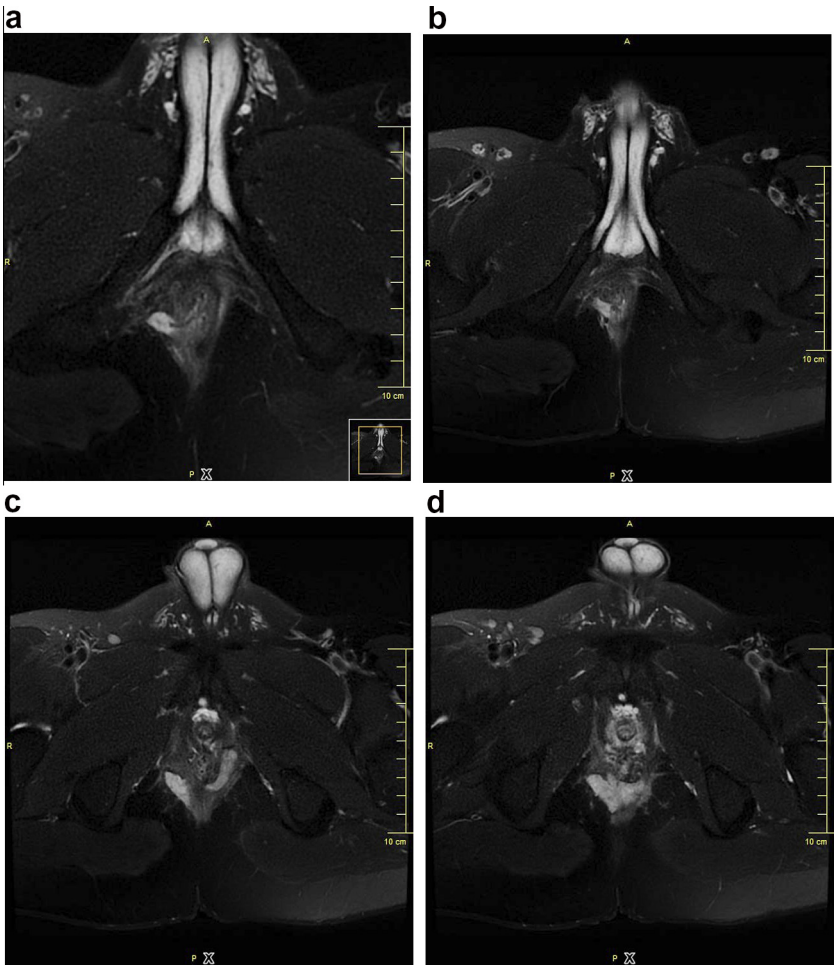

Fig. 6 (a–d): Axial T2-propeller FS images(a and b) show trans-sphincteric branching tract starting from anal verge at 7 o'clock position and ascends superiorly within right ischioanal fossa; (c and d) Confluence of two tracts seen anterior to puborectalis muscle sling with abscess like appearance.

From our study we found that in all the positive cases of perianal fistula, use of combination of MR sequences and imaging planes provided most of the details necessary for an accurate evaluation of perianal fistulas. A combination of an axial and a longitudinal series (coronal and sagittal) provided all the necessary details with coronal images depicting the levator plane, thereby allowing differentiation of supralevator from infralevator infection.

Grading of perianal fistula based on MR imaging is the mainstay of patient's outcome. Classification or grading of fistulas is also important because treatment options are different for different types of peri-anal fistulas. Simple fistulas can be treated with fistulotomy without a significant compromise to continence; however complex fistulas usually end up with retention of continence. We use Parks classification in our department to report and classify perianal fistulas. In our experience, exact location of the primary tract (ischioanal or intersphincteric) is readily appreciated on axial images (Fig. 1). Moreover, the presence of disruption of external anal sphincter well differentiated a transsphincteric from an intersphincteric fistula. Internal opening of the fistula was also best observed in this plane.

In our study twenty-six fistulas (68%) were simple, whereas only 12 fistulae (32%) showed complications including abscess formation, branching course, and inflammatory tissue suggesting an early presentation of patients. However, we did come across 6 (15%) patients who presented with recurrence after history of single or multiple surgeries. All of these patients either underwent surgery without any imaging or carried conventional fistulograms. None of these patients had any preoperative MR evaluation.

Only one case in our study was a perianal fistula associated with Crohn's disease. MR imaging plays a critical role in the assessment of patients with Crohn's disease both in assessing the response to treatment and follow up (8).

MRI imaging of perianal fistulas relies on the inherent high soft tissue contrast resolution and the multi planar display of anatomy by this modality. MRI exquisitely depicts the perianal anatomy and shows the fistulous tracts and their associated ramifications and abscesses. It thus provides an excellent preoperative understanding of the disease, enabling selection of the most appropriate surgical treatment and thereby minimizing recurrence (19). Magnetic resonance imaging depicts infectious foci in the perianal region better than any other investigation modality, including surgical exploration and it helps to reduce postoperative recurrence by 75% in patients with complex disease (20).

Over the past few years, MR is considered as the best imaging modality in cases with perianal fistula because the ability of

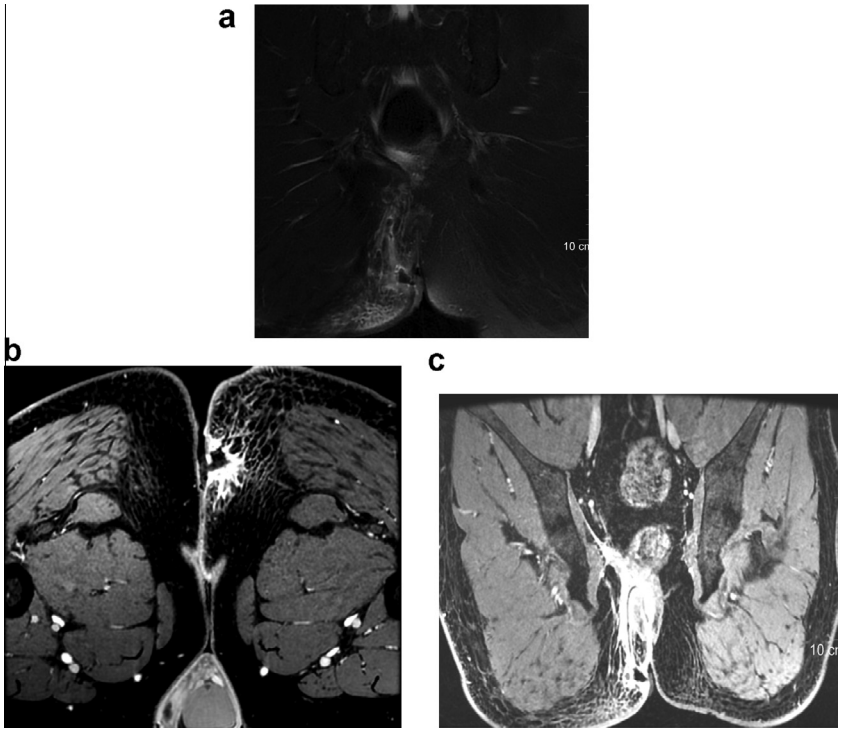

Fig. 7 (a–c): High lying trans-sphincteric fistula opening near ano-rectal junction at 7 o'clock position, course inferiorly along right ischio-anal fossa and externally opening at medial aspect of the defected buttock seen on (a) coronal T2 propeller FS images. Associated surrounding edema and inflammation evident on (b) axial and (c) coronal lava images.

MR imaging to help not only accurately classify fistula tracts but also identify hidden disease that otherwise would have been missed has had a palpable effect on surgical treatment and, ultimately, patient outcome (5–21).

7. Conclusion

Our study supports that, MR imaging provides precise definition of the fistulous track, along with its relationship to pelvic structures, and allows identification of secondary fistulas or abscesses. Accordingly, MR imaging provides accurate information for appropriate surgical treatment, decreasing the incidence of recurrence and allowing side effects such as fecal incontinence to be avoided.

We found that MRI is well tolerated, non-invasive, painless and not embarrassing for the patient has made it the modality of choice in evaluating perianal fistulas.

Radiologists should be familiar with the anatomic and pathologic findings of perianal fistulas and its classification.

Conflict of interest statement

None declared.

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